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 [45] Patented **Jan. 11, 1972**
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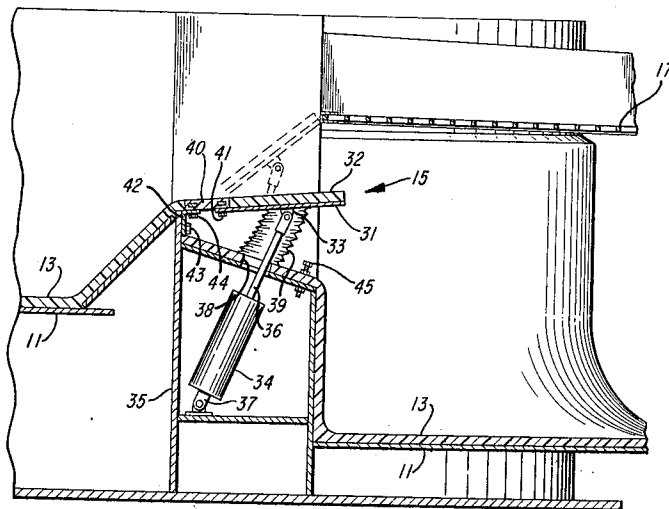
[56]	References Cited		
	UNITED STATES PATENTS		
3,400,495	9/1968	Balz.....	51/163
3,490,181	1/1970	Racine	51/163
3,422,577	1/1969	McKibben.....	51/163

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[54] **FLEXIBLE GATE FOR A VIBRATORY FINISHING MACHINE**
 11 Claims, 6 Drawing Figs.

[52] U.S. Cl. **51/163**
 [51] Int. Cl. **B24b 31/06**
 [50] Field of Search..... **51/163;**
241/175

ABSTRACT: A vibratory finishing machine having a generally toroidal chamber for receiving finishing media and articles to be finished is provided with a pivotable ramp means in said chamber. The ramp means is adapted to deflect the finishing media and the articles to a separator means therefor and comprises a planar member at least a portion of which is free flexing.



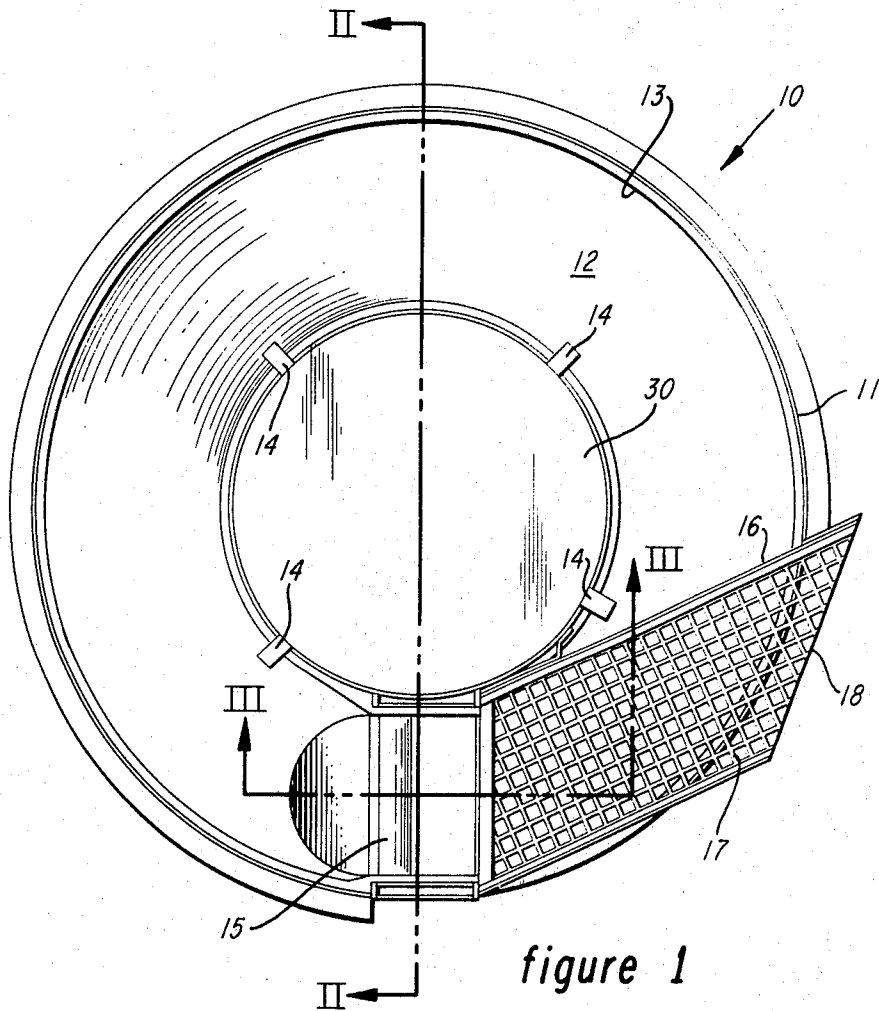


figure 1

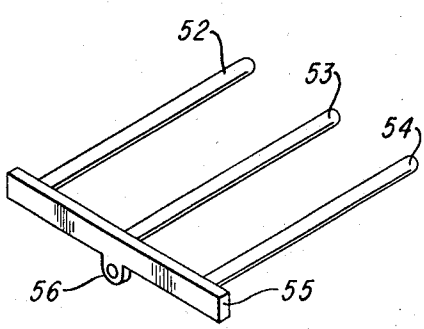


figure 6

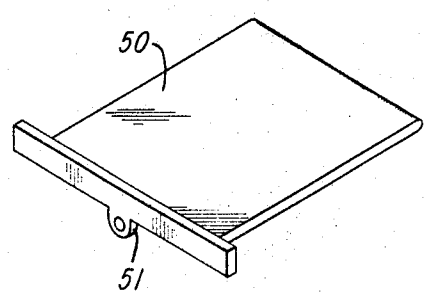


figure 5

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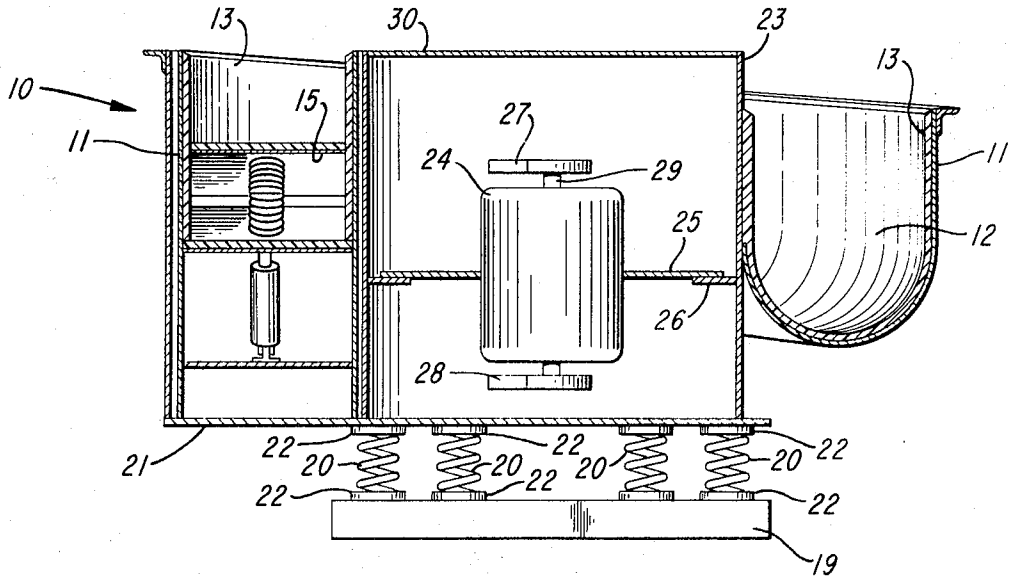


figure 2

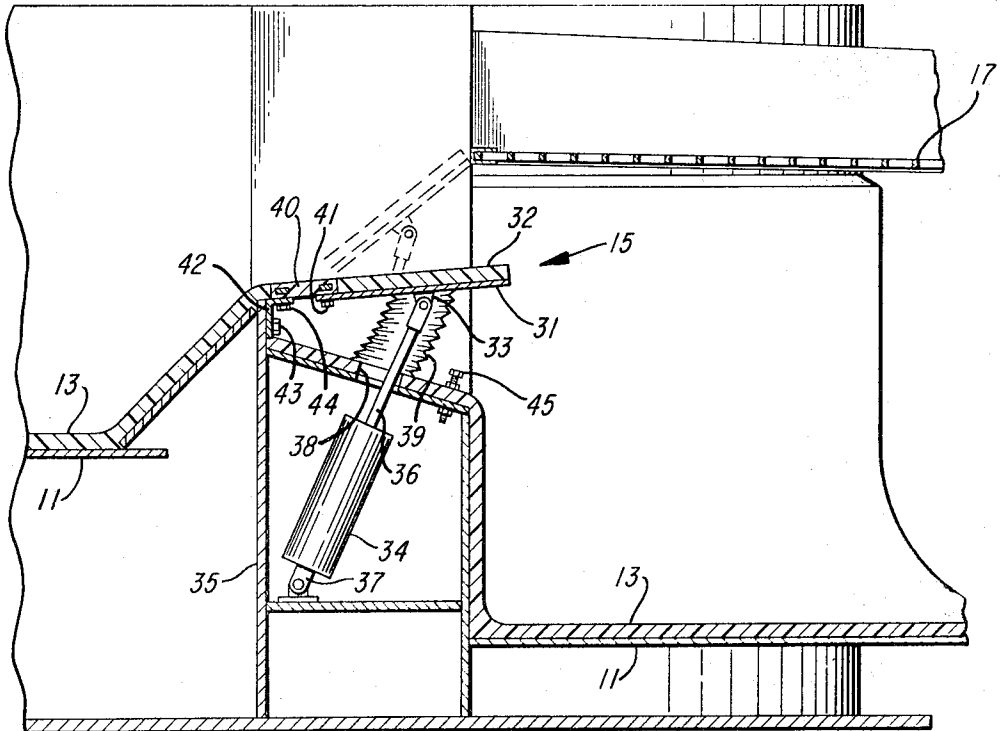


figure 3

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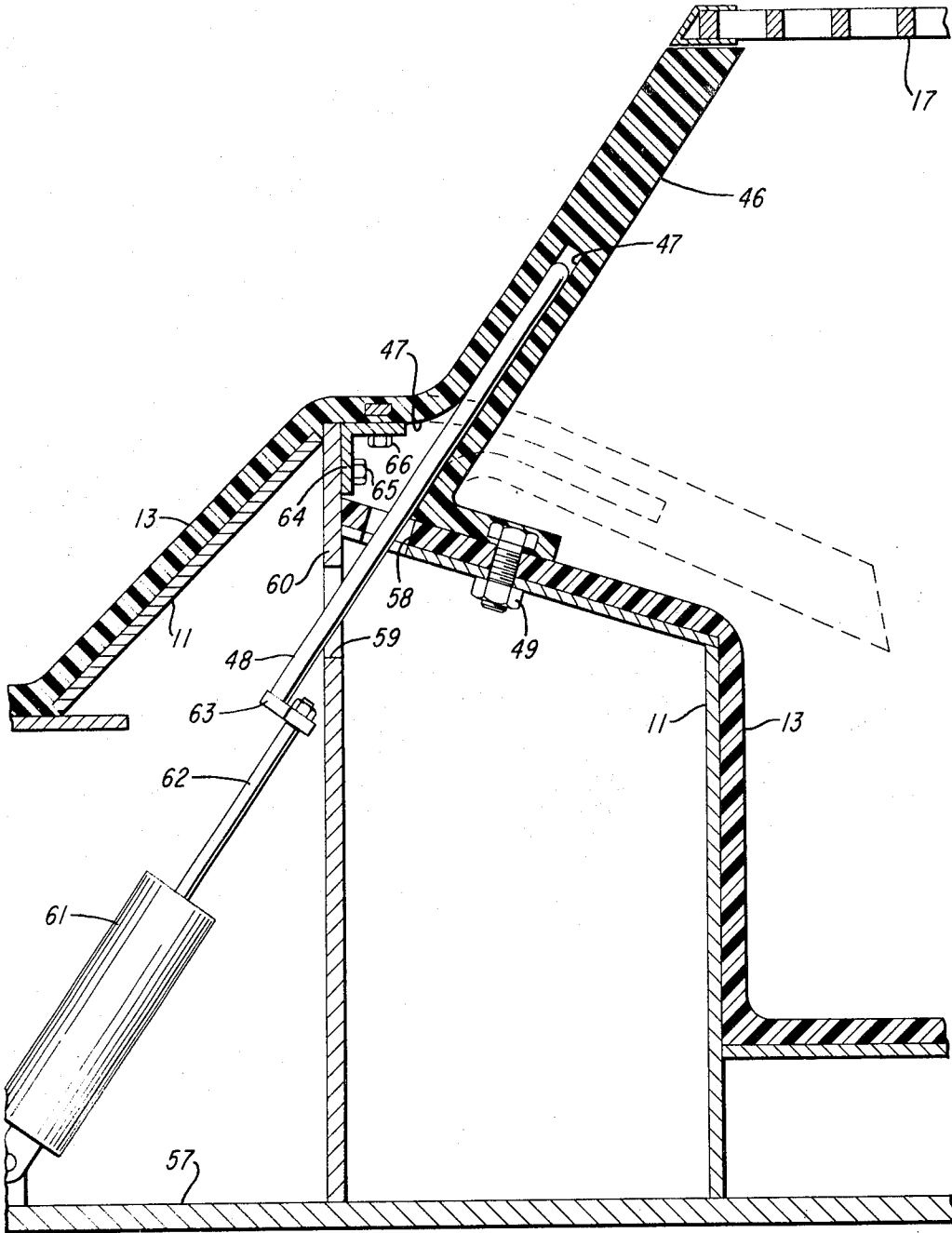


figure 4

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FLEXIBLE GATE FOR A VIBRATORY FINISHING MACHINE

BACKGROUND OF THE INVENTION

Vibrator finishing machines having a toroidal finishing chamber are known. One such machine is illustrated by U.S. Pat. No. 3,400,495. When articles are abraded, ground, deburred, polished, or otherwise treated in a machine of this type, it is periodically necessary to replace spent finishing material and, of course, also to remove the finished articles during normal operation. To this end it is expedient to elevate the contents of the finishing chamber to a separator or discharge chute which is situated at a relatively higher level above the finishing chamber. In order to accomplish this, pivoting gates or vertical weirs such as that shown in U.S. Pat. No. 3,400,495 have been employed.

While such devices are capable of elevating the finishing media and articles contained in the finishing chamber to a relatively higher level, they are subject to excessive wear due to the abrasive action of finely divided finishing materials which find their way between the moving surfaces of such devices. For example, it is difficult to protect the hinge pin of a pivoting gate from the action of the abrasive materials in the finishing chamber, thus the pin requires replacement from time to time. Wedging of the abrasive material is also experienced. Similarly, finely divided abrasive materials find their way in the channels or guideways of a movable vertical weir and cause excessive wear.

It is an object of the present invention to obviate the aforesaid difficulties encountered with prior art devices and to provide a pivotable ramp means within the finishing chamber the actuating parts of which are protected from abrasive attack. Still other object within the scope of this invention will become apparent to one skilled in the art upon reference to the ensuing specification, the drawings, and the claims.

SUMMARY OF THE INVENTION

The present invention contemplates an upwardly or downwardly pivotable ramp means situated within or above a toroidal finishing chamber of a vibratory finishing machine. The ramp means comprises a planar member at least a portion of which is free flexing. The actuating parts of the ramp means are protected from the abrasive environment of the finishing chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings

FIG. 1 is a top view of a finishing machine embodying the present invention;

FIG. 2 is an elevational view of a section of the machine taken along line II—II in FIG. 1;

FIG. 3 is a fragmentary elevational view of a section of the machine taken along line III—III in FIG. 1 and showing a ramp means at an intermediate position;

FIG. 4 is a fragmentary elevational view of another embodiment of the present invention taken along line III—III in FIG. 1 and showing another ramp means at its uppermost position;

FIG. 5 is a side view of a stiffening member; and

FIG. 6 is a side view of another embodiment of a stiffening member.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a vibratory finishing machine 10 is provided with a vessel 11 having a generally toroidal chamber 12 adapted to receive finishing media and articles to be finished. Chamber 12 is lined with a nonabrasive, resilient material 13 such as polyurethane, hard rubber, neoprene, or the like. Spray header 14 are adapted to introduce a fluid finishing compound or the like into the media-article admixture in chamber 12.

Upwardly pivotable ramp means 15 is fixedly mounted in vessel 11 transversely across the bottom of toroidal chamber

12. Separator means 16, usually comprising a screen 17 or other foraminous member adapted to pass through the finishing media but to retain finished articles, is situated over a portion of chamber 12 near the article or parts charging area and so that the finishing media and articles or parts that are deflected upwardly when ramp means 15 is in the upper position spill onto screen 17. Vibratory action of finishing machine 10 causes the articles or parts to move across screen 17 and discharge through chute 18. Alternately, magnetic separation means may be utilized in lieu of a screen or the like in instances where the finishing media is nonmagnetic and the articles can be magnetized. When magnetic separation is used, screen 17 or the like, may be replaced with a noninterfering plate, preferably of nonmagnetic material, to facilitate the attraction of the articles by a magnetic separator. Externally mounted vibrating screens can also be used.

Vessel 11 is oriented in a substantially horizontal position as shown in FIG. 2 and is resiliently mounted on base 19 by means of helical springs 20, or the like, and support plate 21. Springs 20 are conveniently secured to support plate 21 and base 19 by means of retaining cups 22. Toroidal chamber 12 can be substantially level or it may be helical with the lowermost part of the helix being in the charging area and the uppermost part of the helix being situated just before ramp means 15.

Cylindrical support frame means 23 is centrally mounted on support plate 21. Vibratory means such as electric motor 24 is mounted within frame 23 by means of mounting plate 25 which is secured to bracket 26 carried by frame 23. A pair of eccentric weights 27 and 28 are mounted on motor shaft 29, one at each end thereof. If desired, only one such weight may be used; however, greater efficiency obtains if two or more weights are employed. Cover 30 is placed over the top of cylindrical support frame 23.

When toroidal chamber 12 is helical, motor 24 carrying out-of-phase or unequal eccentric weights 27 and 28 preferably is caused to rotate in the descending direction of the helix when relatively low vibrational frequencies are generated and in the ascending direction of the helix when relatively high vibrational frequencies are generated. In this manner articles placed in the charging area of chamber 12 are excited to vibrate in an orbital path in a plane substantially perpendicular to chamber 12. Additionally, a force component imparted by the vibrator means causes the mass comprising the articles and the finishing media to travel upwardly and along the helical path of chamber 12 as the finishing media acts upon the articles.

Referring to FIG. 3, in one embodiment of this invention ramp means 15 comprises a planar member consisting of rigid plate 31 and free flexing strip 40 affixed contiguous to plate 31 along a longitudinal edge of strip 40 by means of bolts such as 41 and is anchored to the bottom of chamber 12 transversely thereacross by means of bracket 42 and bolts 43 and 44. If desired, rigid plate 31 can be clad with sheet 32 which is made of a nonabrasive, flexible material such as polyurethane, or the like.

Alternately, the planar member can be formed as a resilient nonabrasive flap by making flexible strip 40 and sheet 32 from an integral piece of a suitable material in which event rigid plate 31 serves to reinforce or stiffen a major portion of the resulting flap.

Polyurethane is the preferred material for flexible strip 40 because it has been found that it is not only extremely wear-resistant under the conditions encountered within finishing chamber 12, but also withstands very well the flexural stresses imparted thereto when ramp means 15 is moved upwardly and downwardly.

Rigid plate 31 is provided with clevis bracket 33 to which one end of shaft 36 is pivotally affixed in any convenient manner. The other end of shaft 36 is slidably mounted within and affixed to a piston of a fluid-actuated cylinder such as pneumatic cylinder 34 pivotally mounted on auxiliary frame 35 by means of clevis bracket 37. Auxiliary frame 35 depends from the underside of vessel 11.

Shaft 36 passes through opening 38 in the bottom of vessel 11 and is enveloped by flexible boot 39 which seals off and protects the moving parts from the abrasive environment within chamber 12.

Rigid plate 31 abuts against stop 45 when the planar member of ramp means 15 is in its lowermost position, i.e., while articles are being finished within chamber 12. When finishing is complete, ramp means 15 is moved upwardly to its uppermost position, as indicated by the interrupted lines in FIG. 3 and the flowing mass of finishing media and articles is deflected upwardly and spills onto screen 17 whereupon the media is separated from the articles.

Another embodiment of the present invention is depicted in FIG. 4 where the planar member of ramp means 15 consists of resilient flap 46 provided with a hollow central portion 47 which is adapted to receive stiffening member 48 therein. Flap 46 is anchored to the bottom of chamber 12 transversely thereacross in a manner similar to that for flexible strip 40 shown in FIG. 3, i.e., by means of bracket 64 and bolts 65 and 66, and also by means of through bolts such as 49 passing through the bottom of vessel 11.

The stiffening members employed in conjunction with flap 46 can be of various configuration as long as sufficient rigidity is imparted to flap 46 to bring about the upwardly deflection of the mass of articles and finishing media within chamber 12. As shown in FIG. 5 the stiffening member can have the shape of plate 50 provided at one end with perpendicular mounting bracket 51 or, as shown in FIG. 6, the stiffening member can be a series of parallel rods 52, 53, and 54 mounted on an elongated plate 55 normal to the plane thereof. Plate 55 is provided with mounting bracket 56. Brackets 51 and 56 are adapted for engagement with the connecting shaft of a suitable actuating means for the respective stiffening members.

Stiffening member 48 passes through opening 58 in the bottom of vessel 11 and through opening 59 in frame member 60, and is adapted to slideably engage hollow portion 47 at the urging of pneumatic cylinder 61, shaft 62 of which is connected to mounting bracket 63 of stiffening member 48. Pneumatic cylinder 61 is mounted on platform 57 in any convenient manner. During the finishing operation, that is, when the articles and finishing media are cycled around chamber 12, stiffening member 48 is withdrawn from hollow portion 47, and flap 46 assumes the position indicated by the interrupted lines in FIG. 4 and the working mass in chamber 12 flows over flap 46. However, when it is desired to remove the working mass from chamber 12 and/or to separate finished articles from the finishing medium, stiffening member 48 is urged into hollow portion 47 by the action of pneumatic cylinder 61 and flap 46 assumes the upwardly extending position shown, whereupon the working mass is deflected upwardly and spills onto screen 17.

In any of the foregoing embodiments it is desirable to provide the planar member with flexible longitudinal edge portions which are adapted to wipe against the sides of finishing chamber 12. Such edge portions prevent finely divided abrasive grains from wedging between the planar member and sides of finishing chamber 12 thereby assuring smooth operation of ramp means 15.

The foregoing discussion and the accompanying drawings are intended as illustrative but not limiting. Still other variations in the details of construction, arrangements of parts and

the like within the spirit and scope of the present invention will readily present themselves to the skilled artisan. For example, while in the preferred embodiments of this invention an upwardly pivotable ramp means is shown, the ramp means can also be adapted for use from an overhead position without departing from the present invention, in which event the ramp means is downwardly pivotable.

I claim:

1. A finishing machine which comprises

a base;
a vessel having a generally toroidal substantially horizontally oriented chamber adapted to receive finishing media and articles to be finished;

means resiliently mounting said vessel on said base;
vibrator means operably associated with said vessel and adapted to impart vibrations to said vessel;

separator means situated above a portion of said toroidal chamber; and

pivotable ramp means fixedly mounted on said vessel transversely across said toroidal chamber and adapted to deflect said finishing media and articles upwardly to said separator means, said ramp means comprising a planar member at least a portion of which is free flexing.

2. The finishing machine in accordance with claim 1 wherein said planar member is a resilient flap the major portion of which is reinforced on the underside thereof with a rigid plate.

3. The finishing machine in accordance with claim 2 wherein said resilient flap is made of polyurethane.

4. The finishing machine in accordance with claim 1 wherein said planar member is a resilient flap provided with a hollow central portion adapted to receive a stiffening member therein.

5. The finishing machine in accordance with claim 4 wherein a stiffening member is operably mounted on the underside of said vessel and is adapted to engage said flap through and opening in the bottom of said vessel communication with said hollow central portion of the flap.

6. The finishing machine in accordance with claim 5 wherein a fluid-actuated cylinder is operably connected to said stiffening member and is adapted to urge the stiffening member into hollow central portion of the flap.

7. A finishing machine in accordance with claim 1 wherein said planar member is provided with flexible longitudinal edges adapted to wipe against the sides of said toroidal chamber.

8. A finishing machine in accordance with claim 1 wherein said planar member comprises a rigid plate and an elongated flexible strip affixed contiguous to the plate along a longitudinal edge of said strip.

9. A finishing machine in accordance with claim 8 wherein said flexible strip is affixed transversely across the bottom of said toroidal chamber.

10. A finishing machine in accordance with claim 8 wherein said flexible strip is made of polyurethane and wherein the upper surface of said rigid plate is clad with polyurethane.

11. A finishing machine in accordance with claim 1 wherein a fluid-actuated cylinder is operably connected to said planar member and is adapted to impart upward motion to said ramp means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,633,321

Dated January 11, 1972

Inventor(s) William Rise

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 5	"Vibrator"
Page 1, line 8	-- Vibratory --
Col. 1, line 30	"object"
Page 2, line 5	-- objects --
Col. 1, line 71	"header"
Page 3, line 7	-- headers --
Col. 2, line 12	"use"
Page 3, line 22	-- used --
Col. 2, line 45	"vibrator"
Page 4, line 24	-- vibratory --
Col. 3, line 23	"configuration"
Page 6, line 16	-- configurations --
Col. 4, line 15	"vibrator"
CLAIM 1	-- vibratory --
Page 8, line 7 of Claim 1	
Col. 4, line 37	"and"
CLAIM 5	-- an --
Page 9, line 3 of Claim 5	
Col. 4, bridging lines 37 and 38 - CLAIM 5	"communication"
Page 9, line 4 of Claim 5	-- communicating --
Col. 4, line 59,	"upward"
CLAIM 11	-- upwardly --
Page 9, line 3 of Claim 11	

Signed and sealed this 25th day of July 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents